PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference Case 21238	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/03095	International filing date *(day/month/year)* 25.03.2003	Priority date *(day/month/year)* 12.04.2002
International Patent Classification (IPC) or both national classification and IPC A61K7/42		
Applicant DSM IP ASSETS BV et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
16.10.2003	19.03.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Elliott, A Telephone No. +49 89 2399-8218

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 03/03095

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-19 as originally filed

Claims, Numbers

1-8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 8

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☒ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. 8 are so unclear that no meaningful opinion could be formed *(specify)*:

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the Standard.

☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-7
	No:	Claims	-
Inventive step (IS)	Yes:	Claims	1-7
	No:	Claims	-
Industrial applicability (IA)	Yes:	Claims	1-7
	No:	Claims	-

2. Citations and explanations

see separate sheet

The application relates to organosilicone compounds comprising a unit of formula $(Z)(R^1)_aSi\text{-}O_{(3-a)/2}$ wherein a is 0, 1 or 2, R^1 is hydrogen, a saturated or unsaturated C_1-C_{30} hydrocarbon group or a trimethylsiloxy group, Z is an amino substituted hydroxybenzophenone of formula (III) 2-(4'-(R^3R^4N)-2'-hydroxy-benzoyl)-benzoyl-X-Y- wherein R^3 and R^4 independently are hydrogen, C_1-C_{20} alkyl, C_2-C_{20} alkenyl, C_3-C_{10} cycloalkyl, C_3-C_{10} cycloalkenyl or R^3 and R^4, together with the nitrogen atom they are bound to, form a 5 to 6 membered ring; X is -O- or -NR^5- wherein R^5 is hydrogen, C_1-C_{20} alkyl, C_2- C_{20} alkenyl, C_3-C_{10} cycloalkyl or C_3-C_{10} cycloalkenyl; and Y is a divalent C_3-C_{12} alkylene or alkenylene chain; and optionally a unit of formula $R^{2b}\text{-}Si\text{-}O_{(4-b)/2}$ wherein b is 0, 1, 2 or 3; and R^2 is hydrogen, a saturated or unsaturated C_1-C_{30} hydrocarbon group or a trimethylsiloxy group.

The application is further directed to:

(I) a linear diorganosiloxane polymer comprising end units B-Si(R^6)(R^7)- and -O-Si(R^8)(R^9)B', s units of formula -O-Si(R)(Z)- and r units of formula -O-Si(R^{10})(R^{11})- wherein Z is as defined above, R^1, $R^{6\text{-}10}$ are as R^2 above; B and B' are a group Z or a group R^2; r = 0-200, s = 0-50, wherein at least B or B' is Z when s is 0;

(ii) a process for the preparation of the organosilicone compound;

(iii) a cosmetic composition comprising the organosiliccne compound together with cosmetically acceptable adjuvants and additives;

(iv) a cosmetic composition comprising the organosilicone compound for protecting human hair and/or skin against damage caused by UVA irradiation;

(v) a method for protecting human hair and/or skin from UVA damage by applying topically an effective amount of the organosilicone compound; and

(vi) the use of the organosilicone compound for protecting hair and/or skin against UVA damage.

The following documents are referred to in this report:

D1: EP-A-1046391

D2: EP-A-1133980

D3: WO-A-0172935

D4: US-A-6114561

D5: EP-A-0478284

D6: EP-A-0655453

D7: EP-A-0712855
D8: EP-A-0982310
D9: US-A-5270426
D10: FR-A-2684551
D11: GB-A-1167759

III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

As the subject-matter of claim 8 is not clear as it makes reference to the examples, no opinion can at this stage be given as to the potential patentability of this claim. The applicant is invited to redraft the claim to include thereinto subject-matter from the examples for which he desires possible protection.

V Reasoned statement under Art 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

i. Novelty (Article 33(2) PCT)

With regard to the prior art cited in the search report, the subject-matter of claims 1-7 is to be regarded as novel as hydroxybenzophenone-containing organosilicone compounds according to claim 1 and siloxane polymers according to claim 2 are not disclosed in the prior art.

ii. Inventive Step (Article 33(3) PCT)

The subject-matter of claims 1-7 is additionally to be seen to be based upon an inventive step for the following reasons:

Organosilicon compounds having hydroxybenzophenone substituents which act as the sun block constituent of cosmetic compositions are already known from documents D4-D10, these documents being considered the closest prior art. The difference between the organosilicon compounds of the prior art and those being presently-claimed is the presence of the amino substituent on the benzophenone of the presently-claimed compounds and the fact that the benzophenone bonds to the silicone part of the molecule via its non-hydroxy substituted benzene ring (in D4-D10

it is always the hydroxy-substituted benzene ring which attached to the silicone). Documents D4 to D10 are directed to sunscreen agents which have their absorption maximum in the range between the UV-A and UV-B region. For example, it can be referred to figure 2 and figure 4 of document D9, where the maximum of the UV spectrum is at about 300 nm, to document D8 which discloses a λ_{max} of 326 nm as the highest λ_{max} value, to document D7 which discloses a λ_{max} of 337 nm as the highest λ_{max} value of the disclosed compounds (D7, table 1, compound C), or document D6, figure 1 which also discloses a λ_{max} value of about 300 nm. In fact, of all documents D4 to D10 the 337 nm of table 1 of document D7 appears to be the highest λ_{max} value disclosed, but this λ_{max} value is not for a benzophenone derivative.

The object of the present application can be considered as being the provision of (further) compounds which serve the purpose of being UV-A irradiation blockers in cosmetic preparations.

The compounds as claimed are seen to solve this problem and have λ_{max} values ranging from 354 nm to 358 nm (the compounds prepared and tested in the application). The applicant has based his inventive step argument on this increased λ_{max} value of the presently-claimed compounds versus the λ_{max} values for the compounds of D4-D10.

Documents D1-D3 disclose amino-substituted hydroxybenzophenones as UVA blocking agents, D1 and D2 as blocking agents for cosmetic preparations and D3 for use in textiles. The λ_{max} values of these compounds are given as 354-359 nm in D1, i.e. roughly the same λ_{max} values as the presently-claimed compounds.

The compound hydroxybenzophenone itself has a λ_{max} value of approximately 337 nm and the compound o-methoxybenzophenoine a λ_{max} value of approximately 327 nm.

Although, it would appear obvious for the skilled person to substitute the new hydroxybenzophenone derivatives disclosed in D1-D3 for the hydroxybenzophenone parts of the organosilicon compounds of D4-D10 to arrive at compounds achieving the object of the present application, what could not been expected is that the presently-claimed compounds maintained the absorption maxima of the compounds of D1-D3 as the compounds of D4-D10 do not seem to achieve the same absorption

maxima as their non-silicone derivatised equivalent benzophenones (the λ_{max} values for the compounds of D4-D10 when measured in these documents appear 20-30 nm lower than the equivalent benzophenones). An inventive step can therefore be recognised for the presently-claimed compounds, polymers, process for their preparation, cosmetic compositions, method of protection of the human hair and/or skin against UV-A-damage and the use of the compounds for protecting human hair and/or skin against UV-A damage of claims 1-7.

Additionally a skilled person who tries to prepare polysiloxanes absorbing at such a high λ_{max} value faces a number of problems. For example, in the hydrosilation reaction it is very important to use molecules which are easily soluble in the reaction medium. Otherwise, side reactions form inhomogeneous products such as cross-linked polysiloxanes with uncontrolled altered qualities. It is known in the art that UV-A chromophores generally have a lower solubility, e.g. in the usual reaction media such as toluene, in comparison to UV-B chromophores because of the larger conjugated and electronically polarizable system. The higher the λ_{max} value is, usually the worse is the solubility. It was in no way predictable whether the hydrosilation reaction which is necessary to prepare the polysiloxanes of the present invention and which can be used for preparing the compounds of documents D4 to D10 is also successful for preparing polysiloxane-based UV-A screening agents which provide a very high λ_{max} value.

Furthermore, if UV-A chromophores which provide a high λ_{max} value such as e.g. dibenzoylmethane derivatives are linked to polysiloxanes, often photounstable products are obtained, which cannot be used because of the formation of potentially dangerous low molecular degradation products. Unexpectedly, the siloxane-based sunscreens of the present invention were stable even though a very high λ_{max} value could be obtained.

A skilled person knowing from documents DI to D3 certain monomeric amino-substituted hydroxybenzophenones which are useful as UV-A blocking agents would not have considered it likely that these agents do not show the problems of other known monomeric UV-A blocking agents with a high λ_{max} value, which cannot be successfully coupled to polysiloxanes. In particular a skilled person had no reason to assume that the amino-substituted hydroxybenzophenones have a sufficient solubility and that polysiloxanes with these UV-A chromophores are still photostable,

so that they are useful in sunscreen compositions. Applying the could-would approach, a skilled person might have provided the compounds claimed in the present application by combining documents D4 to 10 with documents DI to D3. However, a skilled person would not have done so in view of the known problems which occur, if UV-A chromophores with a high λ_{max} value are to be coupled to polysiloxanes.

Other matters:

Documents D1-D11 have not been discussed in the description (Rule 5.1(a)(ii) PCT).